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NOTICES OF The Aëronautical Society of Great Britain.

At a meeting of the Council of the Aëronautical Society of Great Britain, held at the Society of Arts, John Street, Adelphi, on December 2, 1904. The following gentleman was elected a member of the Society :—

MR. JOHN YOUNG BUCHANAN, F.R.S.

The next general meeting will be held at the Society of Arts in March next, the date of which will be duly announced. Amongst the papers will be one on "Some Recent Experiments in Aërodynamics," by Mr. P. Y. Alexander, and "The Shape of Navigable Balloons," by Mr. Eric Stuart Bruce, M.A., F.R.Met.Soc. This paper will be illustrated by the aërial graphoscope, the invention of the author of the paper, for showing lantern pictures in space and relief without a screen.

THE LIBRARY.

The Library is open to members for reference and the borrowing of books on the first Monday of the month, from 2 to 5 p.m., unless notice is given to members of change of date. The following publications have been presented to the Library :—

By Colonel F. C. Trollope : Publications of the International Aëronautical Commission (July and August, 1903).

By M. Henri Hervé : "La Stabilisation de route des ballons dirigeables" (paper read before L'Académie des Sciences, July 4, 1904).

By V. Hänisch : "Konstruktion für Ermöglichung der Intermittierenden Kraftausnützung."

ERIC STUART BRUCE,
Honorary Secretary.

GENERAL MEETING.

The opening meeting of the 40th Session of the Aëronautical Society of Great Britain was held at the Society of Arts, John Street, Adelphi, on Friday, December 2, 1904. The President, Major B. Baden-Powell, occupied the chair.

The PRESIDENT: The Honorary Secretary will now read the minutes of the last meeting.

The HON. SECRETARY (Mr. Eric Stuart Bruce) read the minutes.

The HON. SECRETARY: I have received a telegram from Capt. Scott, the Commander of the Antarctic Expedition, expressing his very great regret that he could not be present at the opening meeting of the Session to say something about the use of the balloon in the Antarctic regions. But I am very glad to say that in the telegram he holds out a prospect of giving us a paper on the subject when he can manage to do so, and is free from his many lecturing engagements all over the country. I also received a telegram from Dr. Shaw, who wished very much to be here to-night, and who we hoped would speak on Dr. Hergesell's paper. I am sorry to say that at the last moment it has been rendered impossible for him to come, and he has expressed his very great regret.

The Aëronautical Competitions at the St. Louis Exhibition.

BY MAJOR B. BADEN-POWELL.

Having only quite lately got back from the World's Fair Exposition at St. Louis, I feel that some short account of what has been going on there will not be out of place. Our Society was well represented there. Colonel Capper and Mr. Walter Reid both took a prominent part in the meetings of the Aëronautic Conference, and also on the jury in the Kite Competition. It seems very unfortunate that we have not more interesting results to record. The Administration offered numerous large prizes in hopes of attracting inventors and being able to show some startling novelties. But these were not forthcoming. It is with much regret that I feel bound now to refer to this method of offering prizes. The Council of the Aëronautical Society was requested by the Administration of the Exposition to bring the matter forward in England, and we did all we could to encourage competitors to go over and compete. I myself entered for many of the competitions, but I do not now wish to refer to personal matters. I was well treated by the authorities, and only bring forward the subject of the prizes on public grounds.

The sum of 200,000 dollars, or £40,000, was officially said to be set aside for the Aëronautical Competition, of which £10,000 was for expenses and £30,000 to be offered as prizes. I need not now repeat the various conditions laid down, but will merely say that for one reason or another every one of the prizes was withdrawn with the exception of £100 for the Kite Competition. Among the prizes was one of £500, with a second of £200, for a light motor suitable for airships. I took over such a machine and duly entered it, but, after considerable delay, was informed that the prize would be withdrawn, though no good reason was given me for this course being taken. I much fear that such action will have a deterring influence on would-be competitors in similar exhibitions in the future.

As regards the Kite Competition. The first was for the best angle and greatest stability with 800 feet of line. For this there were 12 starters. My own, the only English entry, unfortunately broke its line after being up only half an hour. But, I may be allowed to say, the judges reported very well of it while up. Eventually the first prize was awarded to Dr. Wardwell's son for a beautifully-constructed box kite, the average of seven observations giving an angle of 64°, and nine marks out of a possible 10 given for stability.

The high-flight competition of not less than one mile high was unfortunately a failure, as the very light winds prevailing did not admit of any rising beyond 3700 ft. My special novel form of kite was shown, although some days later Professor G. Bell's tetrahedron kite was flown most successfully.

In the Gliding Machine class there was only one entry, Mr. Chanute's machine, manned by Mr. Avery. The grounds not being suitable for a proper downhill glide, the contest was withdrawn. But on several occasions an exhibition was given, in which the apparatus was towed by a long string which was wound in by an electric winch. This unfortunately ended in rather a nasty fall, in which Mr. Avery sprained his ankle.

As regards Airships, three vessels put in an appearance. The most promising looking was the François-Lambert. This consisted of a large elliptical balloon of 40,000 cubic feet, supporting a car of woodwork with a 25,000 horse-power petrol engine. The chief feature was the method of propulsion. Four screws were employed. Two shafts were arranged, one on each side of the car, and on each end of them a pro-

peller was fixed, the rear screws being much larger in diameter than the front ones. However, here again was misfortune, for owing to accidents to the hydrogen generator the balloon was never filled.

Mr. Baldwin's airship made several ascents. It was of the now usual form with a triangular girder wooden frame and a screw propeller, 10 ft. diameter, in front, rotated by a 5 horse-power petrol engine. On the first occasion (when it was piloted by Mr. Knabenshue, Mr. Baldwin being too heavy), though the wind was very light, it drifted away, making large circles in the air as it went, which seemed to indicate that it was to some extent under control. On a later occasion, when very calm, it returned to the shed.

Mr. Benbow's was a balloon of 16,000 cubic feet, well constructed, and having a more powerful engine of 10 horse-power. It was propelled by a pair of four-bladed feathering paddle-wheels, ingeniously constructed, but evidently wasteful of power. One day this was tried in a practical calm, when it manœuvred up and down the grounds. It was thus possible to get a very accurate idea of its speed, which, from walking alongside the machine, I estimated to be just about three miles per hour. On another occasion much the same result was obtained, but the lift of the balloon was unfortunately not quite sufficient, and it several times came to the ground. It will be gathered from this very brief account that no startling advance has been made in aërial navigation at St. Louis. But at the same time these trials were most interesting to watch; and if one has not learnt exactly how to navigate the air, at all events we have learnt some lessons as to what *not* to do.

Col. Capper: Mr. President, Ladies and Gentlemen,—I do not think I have very much to add to what Major Baden-Powell has told us with regard to the St. Louis Exhibition. As an aëronautical show I think it was not a success, the chief faults being, I think, that the prizes were very big, the conditions were very onerous which had to be fulfilled to gain any particular prize, and the expenses of taking an airship of any sort to St. Louis and staying there were very heavy, so that, even though one machine might have won the big prize, the owners of all the others would have been very much out of pocket. We should have liked very much to have seen M. Santos-Dumont there, but we know he gave up the idea of having his balloon there. We should also very much liked to have seen the Messrs. Wright Bros., and see what progress they had made with their machine. I think at the same time from the experience we gained there we can all do a great deal more in the way of experimenting with gliding machines in this country than has been done. I do not know whether the President would agree with me, but I think we are distinctly behind in the actual manufacture of gliding machines. I shall be very much surprised if we do not hear from America before long of a gliding machine driven through the air by a motor. I am not at liberty to give any details on the subject, but I shall not be surprised if we hear of that being practically done. It seems to me it is rather bad for us to allow the Americans to lead us in that direction. If people who had the ground and the time would make some experiments in gliding machines, I think they would be doing useful work; in fact, much more so than by devoting time and money to those expensive machines that have a gas bag attached. I do not think it necessary that a machine should be in any way very large in order to get, say, a pace of 30 miles an hour. I understand that with a small machine a weight of 2 lbs. per square foot has been supported, and that is very good, because to take a comparatively light machine with a motor and a man would make the whole thing about 800 lbs. or less, and then you need not study the extreme lightness, which we have all been aiming after in the construction of a machine, to the detriment of strength and efficiency.

Mr. Walter Reid: Mr. President,—There is little I can add to what you have already said with regard to what took place at St. Louis and the apparatus we had there. But I think we ought not to be discouraged even if there were not any very brilliant successes. The science of aëronautics has been built on failures, and the more we have, the better the foundation. One often learns more from a failure than from a partial success; in fact, I think that the partial success that has attended ballooning has done more to retard aërial navigation than anything else. At the same time, I think the authorities of the Exhibition, although they imposed rather onerous conditions on those who contended for the prizes, are to be commended in having done what they did to further the science of aëronautics. They went to a great expenditure, not only in the place which they prepared for these

contests, but also in the apparatus—the hydrogen apparatus—and they did a very great deal to further the science of aëronautics in the way they thought best. Perhaps with the experience gained there we shall know better what to do in any future international contests that may be arranged. I think we learnt a great deal from the kite contests. We did not attain such altitudes as last year, but at the same time, having regard to the conditions of the wind and the general conditions, I think we certainly did learn something with regard to soaring. Referring to the gliding machine, I think we ought to recognise the way in which that apparatus was placed at the disposal of anyone who wished to use it. I think that is a point we ought to place on record. Anyone who liked could have the use of that apparatus; it was not protected by a patent, and other people were not prevented from using it. I think that is one of the reasons why it was tried so well. It is quite true we in this country have not done what we ought in that particular line, and I really think if a few gentlemen, who have had experience in the matter, were to unite and get up a small fund for the purpose of making experiments of that kind, it would be very much easier for anyone to carry on experiments than it is now with a number of people trying individually to make separate machines, and perhaps each with some little error. I therefore think that if we were to unite and get up a small fund to make a soaring machine, approved by all of us, and that should be at the disposal of other members, I believe that would prove a practical step in the way of making progress.

On Kites, Kite Flying, and Aëroplanes.

By W. H. DINES,
Vice-President, Royal Meteorological Society.

At the present time kites are used to obtain information about the temperature and humidity of the air above us, and efforts are being made to construct a flying machine capable of carrying one or more persons.

At first sight it might appear as though there were no relation between these two matters, but they are, in reality, very closely connected. The kite is held by a string or wire, and the wind passing over the kite supports it and at the same time causes it to exert an upward pull upon the wire. To fly a kite in the ordinary way the first requisite is sufficient wind, but if the lower end of the string to which the kite is attached can be moved forward with sufficient rapidity, by fastening it, for example, to a fast steamer or motor car, the kite can be flown when there is no wind. The problem of the flying machine consists in replacing the steamer or motor car by an engine and aërial screw, so light that they may be lifted by the kite, and yet so powerful that they may be able to draw it forward with sufficient velocity. In this case the kite is called an aëroplane, and the motor and screw are placed in it or close to it; but these are only matters of detail.

To make a good kite and a good aëroplane is not precisely the same thing; both should be light, and it is most important that both should be stable; both also should be simple, since the more complicated they are, the more liable to damage and derangement; but while a kite should be incapable of exerting more than a limited pull, this point is of no consequence for the aëroplane.

My own experience has been solely with kites, and it is of them only that I am entitled to speak, but there can be no doubt that information about the flying power and steadiness of a kite may be most useful to the maker of a flying machine.

Kites have been used as playthings for many centuries, and it may be stated broadly that in a steady wind of moderate velocity almost any kite will fly. But the flat kites are hardly stable when the wind is strong, and Hargreave made a long step forward by his invention of the box kite, a form which, so far as I know, is embodied in every kite that is stable in really strong winds.

The ideal kite for meteorological purposes should be stable in any wind, and should be incapable of putting more than a certain definite strain upon the wire that holds it. An engineering structure, such as a bridge, is so designed that no part of it shall be subjected to more than one-third or one-quarter of the strain that the metal will bear without breaking, but the kite flyer, if he desires to reach any considerable height, has to be content with a much smaller margin of safety. If a kite could be obtained that always exerted the same pull upon the wire, provided, of course, that the wind surpassed a certain velocity, kite flying would be a

simple process, but the present difficulty lies in this, that if a strong wire be used the height obtainable is greatly reduced, and if a fine wire is used it is liable to break, since the strain to which it is subjected varies so greatly.

The wire I use is $\frac{1}{32}$ in. diameter; it weighs about 16 lbs. per mile, and will bear a weight of from 250 to 300 lbs. without breaking.

Under favourable conditions the process of kite flying is as follows:—A kite 7 ft. 6 in. or 9 ft. high being attached to the wire, the latter is payed out, and the kite allowed to rise, the strain upon the wire meanwhile being from 30 to 60 lbs. At first, for every 100 ft. of wire let out the kite will rise from 80 to 90 ft. from the ground, and when a mile has been released the height may, if the kite be a good one and the conditions favourable, be 4,000 ft., or even a few hundred feet more. But by this time the kite has the weight of a mile of wire to lift, and what is far more important, the pressure of the wind upon the wire forces it away from the zenith, this pressure amounting, perhaps, to more than the weight, and producing certainly a far greater reduction of the height. The wind generally increases somewhat in strength as we ascend, so that although there are 16 lbs. of dead weight acting downwards, and the air is about 13 per cent. less dense at 4,000 ft. elevation, the strain upon the wire where it leaves the winch is the same, or perhaps more than at first. But the wire now leaves the winch in a more horizontal direction, and letting out another 100 ft. will not add much over 50 ft. to the height. When another half mile of wire has been let out the actual height of the kite may be one mile. This, at least, is the average attained at Crinan last summer from H.M.S. *Seahorse*, with a 9 ft. kite and 8,000 ft. of wire. If the observer restricts himself, or for any reason is restricted to, a single kite, he can still continue to let out wire, and he will probably find that with two miles of wire his kite is about 6,000 ft. high, but it will not continue steadily at that height, but will rise and fall, ranging perhaps from 5,000 to 7,000 ft. If the wind is a really steady one more wire can be let out; indeed, on one occasion we let out three miles of wire with one kite, but the greatest height reached, viz. 7,500 ft., chanced to occur with 12,000 ft. of wire, and for that ascent the additional 4,000 ft. did no good. The practice of letting out a great length of wire for each kite employed is not, in my opinion, one to be commended; the additional height gained is small at the best, and the risks of getting the wire entangled in a tree or on the sea bottom are very considerable.

It has been assumed that the conditions are favourable for kite flying. In such a case the ordinary course would be to attach a second kite to the line at about 6,000 or 7,000 ft. and a third at 15,000 ft. Three 9 ft. kites thus arranged would carry five miles of wire and reach a height of three miles.

It may be asked why heights of three miles are so seldom reached, and the answer is a very simple one. It is that the favourable conditions that we have assumed to exist very seldom do exist in practice. It has been, in my experience, much more usual to find that the pull upon the wire varies within wide limits; from 10 to 60 lbs. is no uncommon amount. This is due to variations in the strength of the wind, which are, as a rule, more noticeable when there are detached masses of clouds visible. Under such circumstances kite flying is troublesome; if much wire is let out, during one of the lulls it is likely to drop and become entangled in a tree, and if many kites are put on the line there is the chance that the time at which each is pulling hard may coincide, in which case the line may break. On such occasions it is often possible to attain a very good height, for the variations in the strength of the wind are associated with upward and downward currents in the air. Thus on July 15th last summer a kite at Crinan got into one of these updrafts, and was carried up 2,000 ft. in a few minutes, and with 11,920 feet of wire reached a vertical height of 8,300 ft. During this rapid rise the pull on the wire at the winch reached 100 lbs., and taking the weight of the wire into account, must have exceeded 120 at the kite end, although a few minutes previously the recorded pull had only been 20 lbs.

While one is subject to variations of this kind a strong wire must be used, and such a wire militates against attaining a great height. I think that a single kite might reach two or even three miles, but to do so a large kite and a fine wire are necessary, and with such a combination the risk of breaking the wire is very great. If a kite could be constructed, stable in any wind, or say, stable in any wind short of an exceptional gale, and yet incapable under any

circumstances of exerting more than a definite pull, much of the risk and worry of kite-flying would be avoided. However, it must not be supposed that our present kites are unsatisfactory because there is room for improvement. Mr. Rotch, at Blue Hill, on fixed days, namely, the first Thursday in each month, during recent years has attained on the average a height of over 7,000 ft., and Drs. Assmann and Berson, at Tegel, near Berlin, obtain daily ascents independently of weather by means of kites or balloons, or a combination of the two. Both of these results are in my opinion extremely good. Indeed, the present satisfactory state renders further progress difficult for want of experimental opportunities, because days on which the wind is strong enough to supply a severe test are, in this district at least, rare. The alteration of some small and seemingly trifling detail may make all the difference. A kite may be sent up in good weather repeatedly and fly well, but a bad day comes, and the kite fails, and it is extremely difficult to ascertain the real cause of the failure. Hargreave, the inventor of the box-kite, considers it a "barbarous practice" to make a kite rigid, but others who have had much experience say that a kite should be as "rigid as a house." On this point I think that in a way both may be right; a rigid kite produces a more violent and jerky pull, and is more likely to break the wire, but the flexible kite is more easily deformed, and therefore more likely to become unstable. Which is the greater evil of the two each one must judge for himself.

An aëroplane differs from a kite, inasmuch as uniformity of pull is of no consequence. Stability is the first requisite, but also the lifting power must be great in comparison with the resistance to horizontal motion. This property is the exact equivalent of the "good angle" of a kite. It seems to me that the greatest obstacle in the construction of a flying machine, apart from the question of starting, is the difficulty of getting a light and stable aëroplane. The weight of a kite increases in a greater ratio than the lifting power, and in consequence a large kite becomes either too heavy or too fragile for use. The kites I commonly use contain 60, 84, and 154 square ft. of lifting surface, and weigh about 8½, 11 and 20 lbs. respectively. The same section of stick is used for each, but the large kite is so fragile that it can only be used for the very lightest winds. It is worthy of remark that the large kites will fly in a much lighter wind than the small, although the weight per square ft. is much the same. When sent up in a rising wind the larger sizes fail first through the breaking of a stick; the small kites sometimes break in the air, and sometimes become unstable. With all three kinds we reckon that a pull of 100 lbs. on the wire is about the safety limit, although the velocity of the wind that produces this is of course very different, and the pull has often exceeded 100 lbs. without harm. The aëroplane of the flying machine will be drawn forward by the motor, and once started, its relative velocity through the air, and hence also its lifting power, will depend on the strength of the motor and not on the velocity of the wind. The lifting, therefore, will not need to be uniform, as it should be with a kite, but will be adjusted to suit the most convenient speed. The stability must be greatly influenced by the wind notwithstanding, and I believe that after a flying machine has become a practical possibility in calm weather, its use will for some time be very greatly dependent upon the wind. A strong wind produces considerable disturbance, the air particles do not move forward in parallel paths side by side, but are subject to continual alterations in speed and direction, moving sometimes up and sometimes down, sometimes to the right and sometimes to the left. Thus in strong winds the different parts of a kite or aëroplane are perpetually being forced out of the position of equilibrium, and besides this are subjected to heavy strains, which they would not experience in a perfectly steady wind of far greater velocity. This has been the cause of two fatal accidents, but on the other hand, the only hope of imitating the soaring of large birds lies in utilising these variations, and a flying machine without a motor at all, which has been the hope of many, will certainly be entirely useless in a calm, or, what amounts to the same thing, when the machine is free from the earth, in a perfectly steady uniform wind.

To return, however, to the question of the aëroplane. At present no shape has been designed that will have sufficient stability in all conditions of weather. A kite generally dives, that is, becomes unstable, in consequence of a deformation of its shape, but the diving of a kite is of little consequence. It will not be of little consequence with an aëroplane, on the stability of which the safety of the machine and its

occupants will depend; and how to make an aëroplane with a sufficiently large margin of strength to render it secure against deformation, and yet to avoid a prohibitive weight, appears to me to be at present an insoluble problem.

I certainly endorse advice that has been often given, namely, to make all trials over a lake or the sea. The machine should first, with a dead weight instead of the driver, be flown as a kite from the mast of a fast steamer, the length of the line being so adjusted that the machine cannot fall into the sea or be dashed against the hull of the vessel. If in these circumstances it will not fly, it will certainly not be sufficiently stable for use. If it will fly steadily in all ordinary conditions of weather, the dead weight may be replaced by a man, who, with the motor power at his disposal, should be able to make the line by which the machine is secured to the vessel slack. When he can do this, and maintain his position with a slack line, the first stage of the problem of artificial flight will have been solved.

Colonel CAPPER: I should like to ask a question if I might. Could Mr. Dines tell us the length of time a kite takes to rise to a height, say, of a thousand feet?

Mr. DINES: It all depends. I don't run a kite up as fast as I can, because I want to get the temperature of the air as the kite goes up. I may say, so far as my memory will go, we generally run out a thousand feet in three or four minutes, and we pull in at about the same pace. But, of course, with a light wind we have to get it up as we best can; but with a good wind I think that is about the pace.

Mr. HAWKESLEY: May I ask whether the strength of the wire is increased with each additional height put on?

Mr. DINES: Personally, I do not do that. I obtain a wire in lengths of about eight miles. I have never let out more than six miles, but I like, as far as possible, to avoid joins. But it is quite possible I am wrong; I know the practice on the Continent is to use a gradually thicker wire as you go on; indeed, it has great advantages. On the other hand, so far as I am able to gather, when a break occurs, the break generally occurs where the wires are joined.

Mr. INWARDS: I should like to ask Mr. Dines whether he has tried wires of many strands, because I believe a wire of many strands is stronger than the same weight of ordinary steel wire.

Mr. DINES: I do not, and for this reason. What prevents us getting up a great height is the wind blowing the wire over. A wire cable presents much more surface to the wind than a single wire, and therefore I do not use the cable. The wire I use is a steel music wire; it is exceedingly strong, and I think in proportion to the weight nothing could be much stronger.

The PRESIDENT: Mons. De Fonvielle would like to know whether you would be willing to enter your kite at the forthcoming competition in Paris.

Mr. DINES: I do not go in for competitions. I have so much kite-flying to do from the professional point of view, though I am only an amateur in one sense, but I do not care to go in for competitions.

The PRESIDENT: I think we have had a most interesting paper from Mr. Dines, and I do not think that any words of mine can add to the interest of it, although it has been of special interest to me, as I have done a good deal of kite-flying myself. I ask you to accord a most hearty vote of thanks to Mr. Dines for his very interesting paper.

The vote of thanks was carried by acclamation.

The PRESIDENT: The next paper is on "The work of the International Aëronautical Commission," by Dr. M. H. Hergesell. I have no doubt most of you are aware of the existence of this Aëronautical Commission, which is doing very admirable work from a meteorological point of view. Unfortunately, Dr. Hergesell is not able to be present to-night, so I will ask Mr. Bruce to read his paper.

The Work of the International Commission for Scientific Aëronautics.

By DR. M. H. HERGESELL.

TRANSLATED BY HELEN A. BRUCE.

Since the report which I laid before the last meeting of the Permanent Council at St. Petersbourg, the work of the International Commission for Scientific Aëronautics has been continued on a more extended scale.

In this paper I propose to speak principally of the work of the Commission.

But it will be impossible for me to avoid speaking also of the work carried on by our

members outside the direct work of the Commission, and I hope at some future time they will themselves communicate detailed results of these their independent investigations.

So far, the Commission has met twice, and has shaped its work on the advantageous base of these direct interchanges of thought.

In 1900 the Commission held its séances at the Meteorological Congress of the Paris Exhibition; the accounts were published in the official journal of the Congress, to which I refer you for full details, while here I shall only touch on the most important points.

First, I will recall the motion brought forward by Monsieur Teisserenc de Bort and myself, urging that regular ascents of manned balloons, ballons-sondes, and kites should be organised by the Commission and take place simultaneously once a month.

Secondly, I note the motion of Messrs. Sprung and Teisserenc de Bort in the Cloud Committee (Paris, 1900) to combine cloud observations, especially of those at a high level, with these international ascents, and so to amplify the study of the higher atmosphere.

The two proposals were passed, and, what is satisfactory, they have been perfectly carried out.

Simultaneous ascents have been organised, and since November, 1900, on the first Thursday of each month, at various stations on the Continent of Europe, manned balloons and ballons-sondes, or kites, have simultaneously ascended. Reckoning up to September, 1903, there have been 34 such international simultaneous double ascensions.

The second proposition, for cloud observations, has not been left as only theory in the official reports, but has been reduced to practice. Since November, 1900, 30 stations, scattered throughout Europe, have made cloud observations, not only on the dates of the international ascents, but also on the eve and on the following day. As these observations accumulated, I have tried to classify the cloud stations, but there is much yet to be done in this way. This work will be continued with the object of elucidating the circulation of air currents in distinct but neighbouring meteorological systems by the aid of more perfected cloud observation.

The European institutes that took part in these aëronautical observations were Trappes, Chalais - Meudon, Strasburg, Berlin, Vienna, and Petersbourg-Pawlowsk; and in America we are indebted to Mr. L. Rotch for regular kite ascents since 1901 on the international dates. There were also some ascensions at Munich and at Hamburg, and in the latter city the kite ascensions, especially the later ones, are due to the efforts of Monsieur Köppen.

I made efforts to increase the number of stations and to fill up the vacant points in the international network, particularly towards the west of our Continent. My efforts were successful, especially so at the Berlin Conference, which took place in May, 1902. At this Conference, the official reports of which I am sending in to the International Council, many delegates attended, and amongst others were those of Great Britain, Spain, and Italy, and since then these countries also have taken a more or less active part in our work.

The English ballons-sondes ascents are the work of Mr. P. Y. Alexander, and it was Mr. Alexander who also facilitated M. Teisserenc de Bort's ballons-sondes experiments in England. Mr. Alexander not only procured the balloons and instruments, but ensured thoroughly valuable results by sending his assistant to Strasburg to study in practice the technicalities of these ascents, and the method of reducing their results. Then valuable kite experiments have also been carried out in England by Mr. Dines, in the Crinan Canal in 1902.

In Italy, Monsieur Palazzo, Director of the Central Italian Institute, made balloon and kite air exploration an important feature of its work, and several successful Italian ascents have already been notified.

In Switzerland, Professors Forel and Heim made initiatory efforts, and Monsieur de Quervain sent up some ballons-sondes in Berne. So I seized the chance, and showed all our newest methods to the Swiss Meteorological Commission, with the result that Switzerland now takes an official part in international ascensions.

In Spain, thanks to the zeal of Dom Pedro Vivès y Vich, the Commandant of the Balloon Park, manned balloon ascents have been made on international dates. Monsieur Arcimis, the Spanish Meteorological Director, took a very active part in one of these ascents, and on this fact I found a hope that in future we may count on Spain's assistance in our international endeavours.

The extension of our frontiers to the north and east, brings me to the admirable work of our colleague Monsieur Teisserenc de Bort.

He organised an expedition which he confided to Monsieur de Quervain, with instructions to arrange ballons-sondes ascents in as central a position as possible in Russia, and above all in Moscow. Monsieur de Quervain sent up and recovered 25 ballons-sondes. The results deduced are published in the "Travaux de l'Observatoire de Météorologie dynamique."

In consequence of Monsieur Teisserenc de Bort's Russian mission, the Moscow Meteorological Observatory was able to take a part later on in several of the international ascents.

Finally, there is the Franco-Scandinavian station for aërial soundings at Viborg, Denmark, initiated by Messrs. Teisserenc de Bort, Hildebrandsson, and Paulsen, and quite one of the most remarkable meteorological enterprises we know of. No doubt there will be a special report prepared on the work of Viborg, and so I refrain from giving you details.

Our Commission has ever urged permanent stations in the free air, meaning especially kite and kite-balloon ascents.

This idea has been carried out pre-eminently by the Prussian Meteorological Institute, and especially in the aëronautical Observatory at Tegel. Those of our Commission who were at the Berlin Conference will remember Monsieur Assmann's admirable installations, which have proved the possibility of daily ascensions and of obtaining daily vertical air sections. Since the beginning of this year the results of the daily ascensions have been sent on by wire to the *Seewarte* and published the same day as they were obtained.

Now this is a most valuable branch of meteorological investigation, one that must bear abundant fruit, and no effort should be spared to ensure the establishment of such permanent aërial stations throughout the world.

Our German efforts in this direction have been successfully multiplied. At the kite station at Hamburg, founded by Herr Köppen, ascents are made and observations collected nearly every day, and the results are published in the weather reports in the German *Seewarte*.

Kite-stations are pre-eminently dependent on the weather. Their experiments can only be carried out successfully in places where there is always wind of sufficient force and regularity, as, for instance, on the North Sea at Hamburg. Far from the sea there is too much variability in wind conditions.

I have carried out some kite experiments in mountains, especially at the top of the Vosges, from the balloon belonging to Guebwiller, which is a meteorological station in our Alsatian section. These experiments took place in the autumn and winter of 1900. But even at such a height, the wind was either too weak or too strong, and therefore unfavourable to continuous and regular work.

Still, it is of great importance to have permanent aërial data from such an inland observatory, and so I came to think of the lake of Constance. By means of boat speed the wind conditions could be ameliorated; I thought of this in July, 1900, and I made some experiments with a motor-boat, but without sending up an instrument.

Mr. Rotch was the first man to send up an instrument on a nearly calm day by the aid of a steamer. This was in August, 1901. He then crossed the North Atlantic in one of the regular liners, and took kite observations on six days out of eight. His account was read at the British Association Meeting of Glasgow, 1901. At the Berlin Conference the new idea grew, and Mr. Rotch's proposal to explore the conditions of the upper atmosphere over tropical seas and oceans by the aid of steamboat kite combinations, induced me to continue my Lake Constance experiments, and since June 1902 I have sent up kites there on all the international dates, and on other days as well, by the help of a motor-boat or of a big steamer. The success of these experiments justifies me in saying that, by means of a suitable boat, kite ascensions can be made whatever may be the meteorological conditions. If the wind is too weak to get up a kite, the speed of the boat is added to it, and the sum of their velocities is always sufficient. If there is too much wind the boat is set to go with the wind or at a suitable angle, so as to relieve the pressure on the cable.

So far, I have got up kites to 2,000 metres in a dead calm. The only reason I have not got them any higher is that as yet I have not got a sufficiently rapid boat nor a steam windlass.

I have grounds for saying that, thanks to the German Empire, there will soon be a permanent aëronautical observatory on Lake Constance.

Besides Germany, there are other States that are earnestly striving to establish permanent observatories in the free air. I have spoken of the great Franco-Scandinavian enterprise. At St. Petersbourg our colleague, General Rykatchew, has founded a kite station which is almost incessantly active, and which plays a special part in the international ascents.

Monsieur Teisserenc de Bort has enlarged his already extensive Paris stations by starting the scientific aërial park at Itteville.

While the position of Trappes is particularly favourable to kite ascents, Itteville is the focus of ballons-sondes ascents. A very large installation permits of the use of paper balloons of quite extraordinary cubic feet capacity, as much as 16 or 17 kilometres; these can reach heights which were inaccessible to any other station, until the advent of Herr Assmann's rubber ballons-sondes. The discovery of the famous isothermal zone from 12,000 to 15,000 metres, was the first achievement of these technical niceties and unwearied researches.

I have already alluded to the technical improvements in ballons-sondes due to Herr Assmann.

The limit of height for open ballons-sondes has been attained by Monsieur Teisserenc de Bort's happy design in paper balloons. But it occurred to Herr Assmann to make his balloons of a very elastic material, and then send them up closed. An open paper balloon had to be of 100 metres² gas capacity, to be able to attain to a height of 15,000 metres; while one of these closed india-rubber balloons will attain the same height with only an initial gas capacity of 4 metres².

Thus the sending up of a ballon-sonde is much simplified. Neither a shed nor a large personnel is necessary. The means at the disposal of any ordinary meteorological station are enough. This method has also the secondary advantage of diminished initial cost, though the late rise in the price of indiarubber militates a little against this.

This amelioration in the technical problems has been followed by an improvement in the registering instruments. New thermometers have been designed in Paris, Berlin, and Strasburg.

Monsieur Teisserenc de Bort has shown how important it is to isolate most carefully the temperature column from the rest of the registering apparatus, and how much more exactness is thus obtained in the registration of the temperature of the higher atmospheres.

On my side, I have turned my attention to the study of the sensitiveness of the thermograph, trying to produce a thermometric indicator of the least thermic inertia, and therefore most adaptable to the conditions of natural ventilation in ballons-sondes ascents. I have constructed a tube thermometer which is described in the official accounts of the Berlin Conference.

I think this instrument will register even in very rapid ascents the smallest thermic variations, and especially the inversions of temperature.

While we are on instruments I must especially notice Herr Assmann's valuable barothermohygro-chronographe, in which the action of the pressure record also registers both time and temperature; this arrangement obviates in some degree the inconvenience of clockwork stoppages.

Apart from technical questions, the Berlin Conference discussed and prepared the programme of future work The members of the Commission expounded their views in a series of resolutions which are embodied in the official account of the Commission at, and after, page 60.

The Government of the German Empire have communicated these resolutions by diplomatic channels to the other Governments of the world, thereby hoping to powerfully advance our projects.

I particularly want to draw your attention to two of these resolutions, which are of great importance to the work of the International Commission of Scientific Aëronautics.

First, the 4th resolution, which reads thus: "The International Commission for Scientific Aëronautics considers the exploration of the upper air above oceans and the tropics one of the most important problems to be undertaken in the future. With this end in view the Commission recommend, as a first step, the organisation and dispatch of a ship to the region of the trade-winds, there to examine into the physical conditions of the upper layers of the atmosphere by the aid of kites."

The Council do not forget the zealous labours past and present of Messrs. Rotch and Benson to realise such a project.

To my mind, it would help matters if the Council clearly expressed its views on the details of such an important project, and so materially helped to the realisation of its own scheme by a strong and definite

resolution. I have the honour of bringing forward such a motion before the Council.

Finally, I must speak of the 3rd resolution of the Berlin Conference.

It urges the creation of an official organ for the rapid publication of the results of these simultaneous international ascents and observations, and it asks that sufficient funds to fulfil the conditions should be put at its disposal.

This resolution has only been partially realised—at my request the German Chancellor was willing to defray the expenses of publication of the observations of the years 1901, 1902, 1903, and 1904. With this purpose the German Empire gave us 18,000 marks. This enables us to publish the records in question, but the Strasburg Institute also has to bear a portion of the expense. Up to now two volumes have appeared, and also the monthly publications of the year 1903.

I particularly wish to recall the collaboration of Dr. A. de Quervain, and it is principally to his zeal that we owe the prompt publication of the records of 1903.

In accordance with a formal wish of the Commission, these publications contain only the results of the simultaneous observations tabulated and edited with great care. Thus all the members of the Commission and all persons interested have at their disposal, as quickly as possible, all the data of the work done—material ready for assimilation in scientific works.

At the present moment, as I have said, this work is published at the sole expense of the German Empire, which has guaranteed the funds until the end of 1904.

I am convinced that the continuation of this Publication is a vital question for the future of scientific aërostation. But this continuation can only be secured by contributions towards the expenses from those States that take part in the international ascents.

I should be very grateful to the International Council if it would not only approve our Publication but would also express a direct desire that it should be continued. Such a wish would furnish suitable matter for the deliberations of the coming meeting of the Commission at St. Petersbourg in 1904. And as President of the Commission I should then have a freer hand in carrying on the necessary negotiations and in assuring the needed funds.

If by an international arrangement the continuation of this official Publication could be secured, we should be already halfway to the accomplishment of such an official compilation of the work of international scientific aërostation as is urged in Resolution 3 of the Commission. For, on the basis of our present Publication, all details of a fuller scheme would be easily worked out, and could be discussed and carried at the St. Petersbourg Conference.

In conclusion, I will speak of our programme for the future.

There can be no doubt as to the necessity of continuing in the future the international ascents.

The precious fruits obtained vouch for the value of such a system.

But the very value of the observations calls, in the name of science, for an enlargement of their field of research.

Hitherto, however interesting the meteorological situation, all the simultaneous observations are arrested at the end of a day.

Experience shows us that in an interesting moment it is of the utmost importance, for our fuller knowledge, that the ensuing variations should be noted.

Therefore the tendency must arise to replace isolated ascents by series of ascents. Of course this will mount up technical and scientific labour and expense; on the other hand such an increase can be compensated for by a less number of international days, and by the omission of certain months.

I think we might also economise by having a suitable organisation. At present we pay too much for our instruments. They are made, say, in Paris, Berlin, or Strasburg, by different makers, and this keeps up the price. If our Commission had its own workshop and made its own iustruments, not only should we get them at cost price, but, a very important point, they would all be of the same type.

Some may say, so would the stations lose their individual character. I think, though, this evil could be averted, and that even with a common workshop, each Institute could pursue its own branch of research, and with its own instruments and its own methods.

At St. Petersbourg these questions should be thoroughly sifted.

Whatever may be the decision as to instrument making, I think it is clear that our Commission's next step in research must be to change ephemeral ascents for long-drawn-out series ascents, and so enable us

to follow up above our continent the whole development of a meteorologicial situation.

The PRESIDENT: I feel sure, ladies and gentlemen, that you all know—at all events by name—Mons. de Fonvielle. He has for many years been associated with aëronautics in all its branches. He has come over from Paris especially to attend this meeting, and I am sure we shall be very pleased to hear any remarks he has to make.

Mons. DE FONVIELLE: Mr. President, ladies, and gentlemen, I came to London quite unprepared to make a speech. I thought I came only to listen to the excellent speeches that have been delivered this evening. But I was imprudent enough to tell my friend, your Honorary Secretary, that something had been omitted from the excellent review of the work of the International Aëronautical Commission by Dr. Hergesell, and this observation proved fatal. It is, however, a grand subject; and, as it is one of interest to almost every thinking man, I may perhaps be allowed to offer you a few remarks upon it. One of the most magnificent eclipses of the sun which is likely to be seen during the whole of the present century will take place next year, and will be observable from many parts of both Europe and Africa. The heat from the sun is diminishing rapidly, and it will be important to note what effects will be felt at different altitudes. In the last total eclipse of the sun the zone of totality passed through the United States, and American meteorologists took the opportunity of studying the effect of the diminution of the heat of the sun from a number of stations. But these observations were taken from the ground and not in the air. If observations were taken at a height of several thousand feet, it is certain that changes of heat would be very easily felt, and therefore you could study with some chances of success the effects of the eclipse. It is most important we should know what is the diminution of heat brought about by such phenomena. What is the real heat of the sun is one of the greatest mysteries of meteorology. When this eclipse takes place astronomers will congregate at Egypt from all parts of the world to take observations and get photographs of the disc and the shadow of the sun. If you can get two photographs, one taken from the surface of the ground and the other at a height of about 10,000 feet, and then find them contain certain differences, and if you are aware of the form and number of the clouds, you may, by comparison of these photographs, draw conclusions which will enable you to see if all these phenomena that you observe are real, or if they are merely illusions produced by the clouds. It is most important that we should have observations taken from the ground on the eve of the eclipse as well as on the day and the morning after. At the same time, it would be well to have observations of the phenomena taken from a balloon at a height of about 10,000 feet, and then afterwards we should be able to compare them. There will be some difficulty in the matter, because the shadow will extend to a length of from 30 to 40 miles, but it will only be about 20 miles across. The French Aëronautical Society will be holding a meeting next April, and then the question will be discussed; and there is no doubt they will find the means for sending some of their members to Egypt to take observations from a balloon, and I have no doubt you in England will do the same.

Mr. MARRIOTT: Mr. President, I should like to say Dr. Hergesell has given us a very interesting account of what is being done with regard to the exploration of the upper atmosphere. This is a very important subject, and will certainly lead to very valuable results in meteorology. It is very pleasing to know that so many ascents have been made—I think it was said 30 on one occasion—in various parts of the world. If we could have still more, we should be able to gain a very great deal of information respecting the circulation of the atmosphere. It is very desirable that more observations of this character should be made in this country. Mr. Dines has given us an account of what he has been doing in regard to kite flying with the object of taking meteorological observations, but he gave very little information about his own work. It really comes to this, that some three or four years ago the Council of the Royal Meteorological Society wished to take up this investigation. There were two points that came out that required solving. The first was the expense, and the second was the man to carry out the observations. Mr. Dines was found to be the man to carry them out. But with regard to the question of expense, this was a serious matter, as funds were not available. By the co-operation of the Council of the Royal Meteorological Society and the British Association a joint Committee was formed, and by this means an application was made to the Government

Branch Committee of the Royal Society, and funds were provided for carrying on the experiment. A vessel was hired for a few weeks in the summers of 1892 and 1893; and during this present summer, at the request of the Council of the Royal Society, the Admiralty lent a vessel so that no funds were required for this particular year for the vessel, but certain expenses have been involved in the preparation of apparatus. Mr. Dines has a very successful arrangement of apparatus about which he said very little. One of the essential features of his arrangement is the winding gear. One gentleman asked how quickly a kite could be raised to a certain height. Well, Mr. Dines could do it very quickly, because he has facilities for so doing. We have recently had brought before us in the public Press the question of the closing of the Observatory at Ben Nevis. It seems rather curious this should take place; but it has been ascertained that observations made in the free air are of much greater value than those on mountain tops or the surface of the ground, because the hills and the mountains deflect the currents of air, whereas if a meteorograph is suspended in a kite and kept steady with a current of air flowing along, there is a circulation so that we get as near as possible an accurate record of those altitudes. It is very important that we should not be dependent so much on these spasmodic efforts in this country. If the Meteorological Council or the Royal Society could see their way to organise a permanent station for carrying on these observations all through the year very much better results would be obtained, and this country would then be able to take its full share in this international work, which at present it does not do.

Colonel TROLLOPE: A gentleman who has taken a great deal of interest in these matters was Mr. Patrick Alexander, I believe all his observations from balloons, both with men and without them, are obtained in the publications of the Aëronautical Commission, and I believe our Secretary will be able to show these to anyone who would like to see them.

The PRESIDENT: Mr. Bruce has an additional note to read on Dr. Hergesell's Paper.

The HON. SECRETARY: I think it will interest members to hear that at the St. Petersbourg Congress, in August last, Professor Hergesell brought forward the question of the support of the Publication of the Commission, and it was referred to an international sub-committee, with the result that the International Commission passed the resolution that in the interests of science the support of the Publication by all nations was most urgent—and the Russian Government undertook to approach through diplomatic channels all the countries represented at the Conference, so as to try and further the wish of the Commission. Professor Hergesell also brought forward a proposal that the international ascents should be, in at least one, if not in two, months of the year carried on, on several successive days. The proposal was approved of, and it has been decided that in April, and also at the end of August, 1905, three successive international ascents shall be made, and everywhere at a fixed hour.

Mr. CODY: Ladies and gentlemen, I should like to say one or two words. Mr. Marriott says that meteorological observations ought to be encouraged and extended, and that Mr. Dines has a suitable apparatus. I may say that I believe I possess as suitable an apparatus as can be obtained for controlling high-flying kites, and the reason I did not say anything on the subject of Mr. Dines' paper was that I have financed myself. I have not been assisted by anyone in that way. I do heavy kite flying, and if he had mentioned anything in that line I would have given my opinion willingly. I did one month of meteorological flying; I had a meteorograph, and my highest ascent was 14,000 feet. Since then I have made no attempt at high kite-flying with the exception of Worthing, where I failed.

The PRESIDENT: I think, ladies and gentlemen, our thanks are due to Dr. Hergesell for the very interesting paper that he has sent us. These international meteorological ascents of kites and balloons are matters of very great importance. I also think that our thanks are due to Mons. de Fonvielle for the very kind way in which he has come over from Paris expressly to address you. He has made some very suggestive remarks with regard to the observation of the coming total eclipse of the sun from balloons, and, as he suggests, I think some effort ought to be made to make some balloon ascents from Egypt on this occasion. I will only ask you to accord a vote of thanks to the author of the paper.

Captive Balloon Photography.

BY GRIFFITH BREWER, M. Aer. Soc.

No one can reasonably deny that panoramic views taken from a moderate height give the best idea of the general features of a town or other locality. When we visit a new district we naturally mount a prominent hill or other point of vantage, and so obtain an impression of the surroundings; and the photographer takes his camera as high as he can to enable the lens to receive the view. Far more extended views are enjoyed by those who indulge in balloon ascents, and photographs taken from the cars of balloons are occasionally secured, and give those who stay at home some idea of the ground as seen by the aëronaut.

It is obvious, however, that bird's-eye views photographed from hills and high buildings are taken from arbitrary positions, which may not be high enough to give an extended view, and are possibly situated at inconvenient points, from which the best views cannot be secured; whilst those taken from a free balloon are only of chance subjects—rapidly passed over—as the wind carries the balloon along.

Photographs taken from a captive balloon overcome this last disadvantage, as the cable holds the balloon stationary, and the altitude can be controlled by the windlass on the ground; but captive balloons to carry passengers have to be of considerable size, and require special facilities for inflation and power for driving the hauling gear, so they are usually subject to the disadvantage of being worked from some arbitrary position. The expense of operating an ordinary captive balloon is also an item for consideration, because in most cases it would preclude its use except in exceptional circumstances, and the risk, or rather semblance of risk, is not an inconsiderable item, as it no doubt deters many good photographers from experimenting in this direction, or, if experimenting, from doing the best work they are capable of in less trying situations.

The essential features, therefore, of a practical apparatus for taking aërial photographs include placing the camera at any desired height, from (say) 100 feet to 1000 feet above the ground, and operating the shutter without the necessity of the photographer being close to the camera; the power of working the apparatus from a comparatively confined space without requiring steam engines and the special opening of gas mains by the gas authorities, and the capability of directing the lens to any angle and in the direction of the view to be photographed.

Many years ago it was suggested that photographs should be taken from kites, by sending a camera up the captive line and releasing the shutter by pulling a separate string; and it has also been suggested that views could be obtained by the use of a small captive balloon of sufficient power to lift a camera without the necessity of lifting a man or other operator; but, in spite of these published suggestions, I am unaware of anyone who has worked out a feasible scheme, or who has actually taken photographs in this way.

In considering the practicability of these suggestions, I discarded the kite as being erratic, and requiring too much room to work it satisfactorily, and I decided to employ a balloon which could be inflated through an ordinary household gas meter and be worked from a small garden. My preference for the balloon may partly be accounted for owing to my experience in some forty balloon ascents, made during the past fourteen years, when I have generally been accompanied by a camera of some kind or other. The difficulties I have experienced in taking photographs from free balloons have been most plentiful, but chiefly owing to the fact that during a voyage the balloon is continually rising and falling, and when near the ground—*i.e.*, within 1000 feet—I have been like a pilot in close proximity to a rocky coast, with all my attention required for the safe navigation of my craft, and when once the balloon returns to safer heights, away from trees and other lurking dangers, the distance to the ground becomes too great for satisfactory photography. This is the general state of things when ballooning; but, of course, there are some opportunities for photography, and I have taken advantage of these occasionally with satisfactory results.

The balloon I have been using is made of goldbeater's skin, and is ten feet in diameter with a capacity of 500 cubic feet; the gas employed is coal gas, which passes through a one-inch pipe to the garden from an ordinary 16-light gas meter used in the house, and the balloon can be inflated in the course of two hours. It was necessary to so arrange the camera that it would not be subject to oscillation, and that it could be directed to take photographs, either vertically or at any desired angle; so I had it

Bird's-eye View of seven Houses and Road, taken from an elevation of 500 feet.—*By kind permission of Editor of* TECHNICS.

Bird's-eye View of Broomwater Creek from elevation of 500 feet.—*By kind permission of Editor of* TECHNICS.

mounted on trunnions in a frame within the hoop of the balloon in such a manner that it could be adjusted to any angle and clamped in position before each ascent. In order to prevent the captive line obstructing the lens, and so as to prevent the vibration of the line being directly communicated to the camera, I place a cross-tree over the hoop and bring a cord down in the shape of a V so as to form a bridle, and the captive line is attached to this bridle at its base. The shutter of the camera is made to move by means of a spring released by a trigger mechanism, and an electro-magnet arranged near the shutter operates this trigger and receives its current from batteries on the ground, the current being conveyed by way of two insulated flexible wires which run parallel with, and are connected to, the captive line. The circuit is completed by means of a switch, the current being sent not only through all the wire suspended in the air, but also through that wound on the reel holding the remainder of the captive line.

The question naturally occurs to one, How is it possible to take a view towards a given object without being up in the air oneself to point the camera in the required direction? I will endeavour to explain how this may be done by assuming as an example that it is desired to take a view to the west of the position from which the balloon is being operated.

I have found by experiment that by attaching the cross-tree slightly out of centre on the hoop that the wind will not cause the balloon to rotate, but will make it slowly rock on a vertical axis within the limits of a half circle. The camera is therefore set on its trunnions to the requisite inclination on that side of the circle containing the locality to be photographed, in this instance the west, and then when the balloon is in the air the lens will slowly turn (say) from north to south by way of west. At a height of 500 feet it is difficult to observe the direction in which the camera is pointing, but the simple contrivance of tying a handkerchief to the net of the balloon above the lens indicates the direction quite clearly; and while the balloon rocks on its axis it is easy to choose from the ground the right moment when the switch controlling the electric current should be operated. Thus when it is seen that the handkerchief is towards the west, the button is pressed, and the plate is exposed simultaneously.

(Several photographs taken by means of the apparatus described above were exhibited on the screen).

The PRESIDENT: I am sure we are all very much indebted to Mr. Griffith Brewer for the interesting little account he has given us of his photographic experiments from balloons.

Mr. FROST: Ladies and gentlemen, no doubt you share with myself feelings of gratitude that our President should have gone across the Atlantic and visited the Exhibition at St. Louis, and seen all there was to be seen there. He tells us, and we regret to hear it, that there were no wonderful inventions forthcoming; but we must remember that we have set ourselves, I think, an extremely difficult problem to solve, but, nevertheless, it will be solved. And in proposing a vote of thanks to our Chairman, I am sure we are all thankful to the promoters of the St. Louis Exhibition for the opportunity and encouragement they have given to the aëronauts of the world. Ladies and gentlemen, I beg to propose a vote of thanks to our Chairman, Major Baden-Powell.

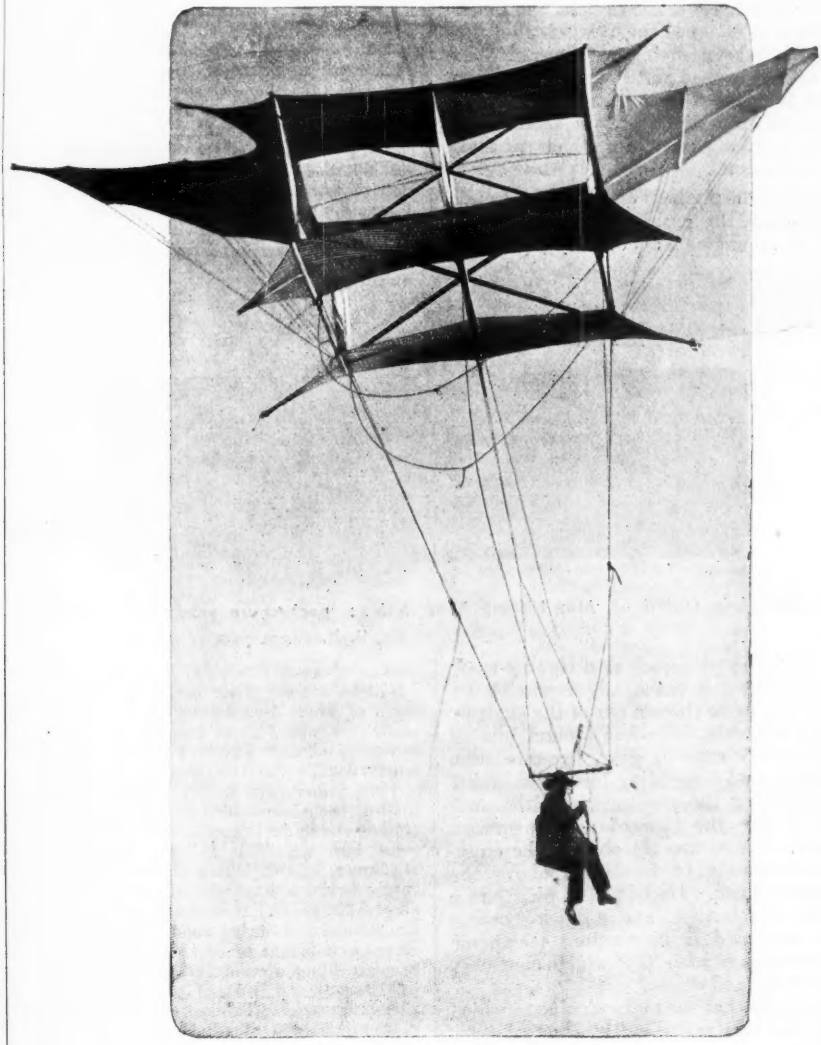
Colonel FULLERTON: I beg to second that.

The PRESIDENT: I beg to thank you for the exceedingly kind way in which you have received that motion.

The proceedings then terminated.

Man-Lifting Kites.

By the courtesy of Mr. S. F. Cody, we are enabled to reproduce some illustrations of his man-lifting kites which have not only aroused public attention, but that of the Admiralty and War Office. Mr. Cody may certainly be congratulated on the success that has so far attended his experiments in man-lifting with his winged-box kites. The trials with his system, both on the ironclads placed at his disposal by the Admiralty and at Aldershot, seem to promise that at no very distant future the captive observation balloon, limited in its use to fairly calm weather, will be efficiently supplemented on windy days by the observation kite. In a well-illustrated pamphlet on the subject which Mr. Cody has recently circulated, he thus describes his method of man-lifting. "When an ascent is decided upon a pilot is sent up—*i.e.*, one of the smaller grade of aëroplanes, and this is held captive by a small

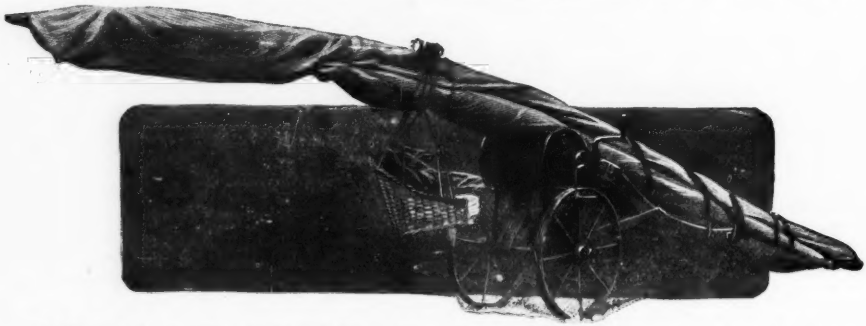


The Cody Man-lifting Kite, 800 feet high.—*By kind permission of* MR. S. F. CODY.

rope or wire, the latter being made fast to a galvanised wire cable. This aëroplane is allowed to carry the cable as high as it will. Then other airships, similar in construction to the first, but somewhat larger in size, are attached, and sent floating up the main hawser until they reach the particular destinations assigned them, when they immediately take up flying positions, this process being repeated until a sufficient strain or pull is attained on the main cable to bear the weight of the aëronaut, who ascends now to the desired point from which to make his observations.

"He conducts these observations from a basket chair, the position of which is tilted back to an angle of about sixty degrees, so that the man's position is as if leaning back, thus rendering it practically impossible for him to slip or be thrown out of the chair by passing currents. He has around him all the necessary steering gear, together with ascending and descending lines, and brakes for controlling the movements of the aëroplane during the upward and downward journey. These are attached to the cross-bar immediately in front and above the aëronaut's head. He has also with him a camera, a telescope, and a quick-shooting small arm, and is in constant telephonic communication with the winch controller whether on land or sea."

It appears that the highest point to which a man has been raised by Mr. Cody's kites is 1600 feet.



A Complete Outfit of Man-Lifting War Kites: packed up ready for travel.— *By kind permission of* Mr. S. F. Cody.

Notes.

The Aeronautical Exhibits at the St. Louis Exhibition.—The following note on the aëronautical exhibits at the St. Louis Exhibition was received from Major B. Baden-Powell during his visit to St. Louis:—"Any visitor to the 'World's Fair' who only stayed for a few days might easily come away with the impression that the aëronautical exhibits were very few and meagre. It is true they are 'far between,' for many different departments contain objects which may be classed under this head, and it is only by going carefully through all the vast buildings that one lights on something here and something there. We may first take the Transportation Building (in a room of which the Aëronautical Conference was held). At one end of this may be seen hanging from the roof some specimens of kites, notably those of Professor Alexander Graham Bell, of tetrahedron form. Unfortunately, the description given on the label below is not very full, and instead of describing what these kites have actually accomplished, it states that by means of such kites, '1, 2, 3 or more men might be lifted.' That might be said of any form of kite. Not far off is a very perfect model, perhaps 20 feet long, of M. Deutsch's navigable balloon 'Ville de Paris,' of 2,000 centimetres capacity, and 60 horse-power engine.

"Near the centre of this building is the exhibit of the Aëronautical Society of Berlin, including the actual large balloon 'Berson,' blown tight with air. This balloon, constructed by Riedinger, of two layers of cloth with india-rubber between, has travelled a total distance in all of 8,200 miles. Near by is the car in which Dr. Berson and Süring made their memorable ascent to a height of 35,430 feet. The ballast bags are hung around the car as they were in this ascent. A sort of photographic gun is shown for taking balloon surveys, and specimens are framed showing the very ingenious and important method by which a perfect map may be constructed from two photographs of the same place taken from different points of view. Four model spherical balloons hang near, illustrating Dr. Finsterwalder's method of constructing balloons, so as to economise sewing of seams and waste of material. A large map of Germany shows the places of descent of all the balloon journeys conducted by the Society.

"In the Social Economy Building is another exhibit of German appliances. Here are several kites and a full-sized meteorological kite-balloon, as well as numerous instruments for use with them.

"In the United States Government Building we again come across a meteorological kite with its winch and instruments, while further along in the same hall may be seen two of the most interesting exhibits. These are Professor Langley's model 'Aërodromes,' one of which, it may be remembered, flew successfully for three-quarters of a mile in 1896. This machine weighs 30 lbs., and has a steam engine of 11·4 brake horse power. The other is a quarter size scale model of the larger man-carrying machine which has unfortunately failed to accomplish what was expected of it. The weight of this model is 58 lbs., and is provided with a gasoline engine of 3 b.h.p., weighing only 10 lbs.

"But anyone interested in the subject will naturally go off to the other end of the show grounds to visit the Aëronautic Enclosure. Here a large field is enclosed with a high wooden fence which is continued up to a height of 30 feet with openwork palings to form a wind screen. Near the centre of this is a large balloon house, and at the far end is installed the hydrogen gas making apparatus, The balloon shed is divided longitudinally into three parts, in one of which is spread out M. Françoise's big balloon of 1,850 centimetres, and its somewhat clumsy-looking car of woodwork. This contains a nice looking but heavy petrol engine, connected by belting to four screw propellers, the two front and smaller ones being on the same shafts respectively as the two larger hind ones.

"In the second division of the balloon shed is a small captive balloon, frequently taken outside and let up when the weather is favourable, and Mr. Benbow's small navigable balloon, in which a four-cylinder 10-horse power engine rotates two feathering paddlewheels of rather novel form. The whole idea seems neatly worked out and well made, though the power lost through the gearing and complicated mechanism is likely to prove detrimental to efficiency.

"The third portion of the building is divided into smaller compartments containing a complete working model of an electrically propelled balloon, by Mr. Carl Myers, the framework for an airship with a 5-horse power motor and propeller, belonging to Mr. Baldwin (formerly well known as a parachutist), and finally the gliding machine with which Mr. Avery has been conducting a number of experiments for Mr. Chanute. This is of the well-known two-decker pattern, beautifully constructed of spruce wood and steel wire stays, the latter strung so tightly that each gives a harp-like note on being struck. The covering of white silk is stretched as tight as a drum and varnished with a special collodion preparation. The whole machine is wonderfully light and rigid."

The International Aëronautical Commission.—The fourth conference of the International Commission for Scientific Aëronautics took place at Petersbourg, from the 29th of last August to the 3rd of September. The President, Professor Hergesell, announced that Spain, Italy and Switzerland had entered into the International Union, and were taking an active part in the work. New observatories had been started at Muster Reinickendorf and Trappes, and floating ocean observatories were in formation. He urged the support of the publication of the Commission as the bond of union of their nationalities. An important result of the Congress is the arrangement that in April and at the end of August there are to be international ascents continued on three consecutive days, the 5th, 6th, and 7th of April, and 29th, 30th, and 31st of August, 1905. These ascents will take place at the same time at all the international stations, and a great increase in the value of these observations is expected from such a prolonged study of the atmospherical conditions throughout the world.

M. Teisserenc de Bort gave some interesting statistics as to the rarity of loss of ballons-sondes. M. Assmann states that of 90 rubber balloons sent up from Berlin only one was lost. In Moscow, during the winter, of 26 balloons sent up, 25 were recovered. As regards the instruments and their records, the curves were still serviceable after a year's exposure, and longer, in the open air before being found.

The success, practicability, and value to meteorological and aëronautical science of the ballons-sondes work cannot be too much insisted upon, and it is to be wished that Britons who so favour work of a practical nature would allow their attention to be drawn to an active participation in this branch of international research. At present, it is the efforts of Mr. P. Y. Alexander alone—the only British observer—that redeem our country from the reproach of barrenness in ballons-sondes research. Many more such observers are needed.

The Honorary Secretary of the Aëronautical Society of Great Britain communicated a paper on Kites to the Congress. Mr. P. Y. Alexander and Dr. Shaw, members of the Society, were present at the Congress, and the latter exhibited one of Mr. Dine's registering instruments for use on kites, which can be made for the small sum of only £2 10s.

Experiments with Señor Alvarez's Aëroplane.—Some interesting experiments were recently made with Señor Alvarez's aëroplane from the grounds of the Welsh Harp, Hendon, by Messrs. Spencer Bros. A balloon of 23,000 cubic feet capacity was used to carry the aëroplane to a height of 3,000 feet, where it was automatically liberated. No person ascended with the machine, but it was weighted to represent one human being. It is stated that at first it displayed a propensity to dive downwards, but afterwards proceeded steadily in a horizontal direction, the propellers revolving rapidly. The aëroplane travelled at good speed for about a

mile and landed in an open meadow, where it was recovered. The machine is said to have sustained no injury owing to its journey in the air and subsequent descent to earth.

The 50,000 francs Aëronautical Prize.—Mr. Henry Deutsch and Ernest Archdeacon have offered a prize of 50,000 francs (£2,000) to the owner of the first aërial appliance, without balloon, that accomplishes the distance of a kilometre, without touching earth, in presence of the committee appointed by the Aëro Club of France.

The First Balloon Ascents in England.—The *Queen* in a recent issue gave an interesting account of the first balloon ascent in England. As that periodical points out, the honour of the first ascent has often been ascribed to Lunardi, but James Tytler, one of the editors of the "Encyclopædia Britannica," described as an eccentric genius, no doubt forestalled Lunardi by making a not very successful ascent from Edinburgh in August, 1784. It appears that his failure brought ridicule upon him, and he languished in obscurity, while Lunardi, who made the second ascent in this country, became a hero. Lunardi held a post in the household of the Neapolitan Ambassador, and he set all London on tiptoe with expectation and excitement when he advertised that he had undertaken the construction of a globe, 32 feet in diameter, with which he intended to ascend as soon as completed to make the most interesting experiments, especially that of going several miles before the wind, and keeping the globe constantly not higher than a gunshot. A rival, M. de Moret, elected to make an ascent near the spot which Lunardi had chosen, so the latter was forced to change his plans, but ultimately obtained permission to use the Artillery Ground at Moorfields, and on the day in question an enormous crowd gathered at the advertised spot. Lunardi, who was advised to use gas instead of heated air, as Tytler had done, rose successfully and touched earth first at North Mimms, and finally at Standon, near Ware, where he was received at first in hostile fashion by the astonished rustics. Lunardi became the popular hero of the day. He was entertained by the Mayor and Corporation of the City of London. Articles of attire were named after him, including a popular bow tie.

Obituary.

THE REV. J. M. BACON.

Just when on the point of making an announcement in the current number of this journal that at the next general meeting of the Aëronautical Society of Great Britain the Rev. J. M. Bacon would give to his fellow members an account of his acoustical experiments in balloons, came the sad news of his death on Christmas night. Only a few days before his lamented death Mr. Bacon gave a public lecture in London, and it is supposed that his fatal illness was due to a cold caught on leaving the lecture room. Mr. Bacon was widely known by his many articles on the subject of ballooning which he contributed to the *Times*, *Morning Post*, *Nineteenth Century*, and other newspapers, and periodicals, also by his very popularly written books "By Land and Sky," and "The Dominion of the Air;" but perhaps even more so by his frequent balloon ascents, during which he studied various conditions of the air and displayed an undaunted courage. His skill as a balloon photographer was, perhaps, unsurpassed, and many of his photographs have been exhibited at the meetings of the Aëronautical Society of Great Britain; and at the soirée of the Royal Society in 1903, he had the honour of showing an exceptionally choice collection to H.R.H. The Prince of Wales. But there was another side to Mr. Bacon's scientific work, one, perhaps, not so widely exposed to public view—his astronomical qualifications. He took part in eclipse expeditions of the British Astronomical Association to Vadso, Lapland, in 1896; to Buxar, India, in 1898, being in charge of the party; and to Wadesboro, North Carolina, in 1900, when he was again in charge.

Mr. Bacon possessed those admirable personal qualities—geniality and kindness—which gained him friends amongst all who knew him.

MR. THOMAS MOY.

We regret to announce the death of Mr. Thomas Moy, one of the early adherents of the Aëronautical Society of Great Britain, who breathed his last on December 2nd, at the advanced age of 85.

Mr. Thomas Moy was throughout his life a keen student of aëronautics, especially of what related to the attempts to navigate the air by a body heavier than air.

In the early reports of the Society his name appears frequently in the discussions.

Only three years ago he experimented on a wing machine which ran on a wooden railway.

The chief principle of this apparatus was described to the members of the Aëronautical Society of Great Britain in March last.

In the appendix of "Progress in Flying Machines," by Mr. Octave Chanute, is published a paper by Mr. Thomas Moy on "The Flight of the Albatross."

Foreign Aëronautical Publications.

(In this list a selection of some of the more notable articles is only given).

L'AÉRONAUTE (Paris).

October, 1904.—"Parti que l'on peut tirer, dans les diverses branches de la Science du cerf volant enlevant les appareils."

November. — "Les Ballons Captifs" (Drudogi).

December.—"Sur les difficultés des ascensions aérostatiques dans les régions montagneuses."

L'AÉROPHILE (Paris).

October.—Les Alpes en Ballon (Spelterine). Reprise des Expériences du "Lebaudy" type, 1904. Le Projecteur du Lebaudy.

ILLUSTRIRTE AËRONAUTISCHE MITTEILUNGEN (Strassburg).

October.—Les Femmes Aëronautes (G. Espitallier). Internationale Kommission für wissenschaftliche Luftschiffahrt. Hervé Schraube am Korbe des Méditeranéen No. 2. Dr. Alexander Graham Bell's Tetraedrisches Bauprinzip für Drachen und Flugmaschinen.

November.—Der Ballon Lebaudy; Uber die 4 Konferenz der internationalen Kommission für wissenschaftliche Luftschiffahrt in St. Petersburg vom 29 August bis 3 September, 1904.

December.—Die deutschen Frauen und die Luftschiffahrt; Die Geschwindigkeit von vertikalen Luftbewegungen. (H. Elias.)

WIENER LUFTSCHIFFER-ZEITUNG.

October.—Die Ausstellung in St. Louis; Basral und Bixio.

December.—Vom St. Petersburg Congress; Aus St. Louis.

LA CONQUETE DE L'AIR (Brussels).

November 15.—Les Travaux de M. Langley.

December 1.—Le Centenaire du Gaz; Les Aérostats à Air chaud ou Thermostats.

Applications for Patents.

(*Made in October, November, and December, 1904.*)

The following list of Applications for Patents connected with Aëronautics has been specially compiled for the AËRONAUTICAL JOURNAL by Messrs. BROMHEAD & Co., Patent Agents, 33, Cannon Street, London, E.C.

20929. September 29th. HENRY SHEPLEY BOOTH. **Improvements in Aerial Machines.**

21312. October 4th. GEORGE COLEMAN BROWN. **Improvements in Air-ships.**

21477. October 6th. ATHANASSIOS MARINAKIS. **Improved Manner of Steering an Air-ship.**

22802. October 22nd. CHARLES ARTHUR BARRETT. **Combined Balloon and Parachute for Raising and Dropping Printed Advertising Circulars.**

23786. November 2nd. ALAN GEORGE FISHER. **Improved Air-ship.**

24807. November 15th. GUSTAV KNAPPER. **Improvements in the Propulsion of Bodies Floating in the Air.**

27043. December 12th. ARTHUR HENRY PHILLIP BLUNT. **Improvements in Flying Machines.**

27153. December 13th. WILLIAM EDWARD BURTON. **Improvements in or Relating to the Driving of Air-ships and the like.**

28264. December 23rd. ANTHONY JOSEPH WESTLAKE. **New or Improved Aerostatic Apparatus.**

29185. December 30th. JAMES RILEY. **Improvements in or Connected with Aerial Navigation and Vessels and Apparatus Thereto.**

29261. December 31st. WILLIAM MACLEOD. **Screw Tractors for Ships' Boats, Aerial Vessels, and the like.**